

LOMATIUM TAMANITCHII (APIACEAE) A NEW SPECIES FROM OREGON AND WASHINGTON STATE, USA

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ABSTRACT

Lomatium tamanitchii (Apiaceae), is a newly discovered substrate-specific, narrow endemic species. The species grows on clay soils in grassland swales and gentle slopes in the Columbia Hills of eastern Klickitat County in south-central Washington State. A small disjunct occurrence has also been recently recognized in Union County, Oregon. The species is most typically distinguished by a multi-branched caudex surmounting a large, thick, blunt-tipped taproot. It is identified by its sparsely to densely short hairy leaves with broadly winged petioles, and its narrowly elliptical dorso-ventrally compressed fruits that have short hairs and distinct narrow raised ventral ribs. *Lomatium tamanitchii* is clearly distinct from all other species in the genus as based primarily upon gaps in characters of fruit morphology and vestiture. Populations occur in dense near-monocultures strictly confined to shrink-swell soils derived from devitrified silicic volcanic ash on massive landslide deposits. The known range of *L. tamanitchii* is restricted to a small area in eastern Klickitat Co., Washington and several hundred plants in a newly-discovered disjunct population approximately 180km distant in Union Co., Oregon. This limited distribution raises conservation concerns. *Lomatium tamanitchii* is compared with morphologically similar taxa growing in nearby areas of the Columbia Basin.

Key Words: Columbia Hills, Klickitat County, *Lomatium tamanitchii*, narrow endemic, shrink-swell clay soils.

The Columbia Basin region, of Washington and Oregon east of the Cascades Mountains is populated with over 40 taxa of *Lomatium* (USDA, NRCS 2009). It is the largest genus of the Apiaceae in North America (Mathias 1938; Simmons 1985), with 74–85 recognized species (Simmons 1985; Constance 1993; USDA, NRCS 2009; ITIS 2009). The genus is a taxonomically challenging group with little evidence of infra-generic alliances based on morphologic and molecular data (Soltis and Novak 1997). Surprisingly, there is little evidence of hybridization in the genus (Schlessman 1984).

Lomatium is comprised of numerous taxa with broad geographic distributions, and also with a large suite of narrow endemic species. A number of species in the genus have been described in the last few decades (e.g., Schlessman and Constance 1979; Evert 1983; Gill and Mastroguiseppe 1983; Kagan 1986; Hartman and Constance 1988; Constance and Helliwell unpublished). Thus, *Lomatium* is one of the more prominent genera still actively contributing to our understanding of vascular plant diversity in western North America. It is a genus clearly in great need of further taxonomic attention.

While understanding of substrate specific endemism in the genus, most notably on residual

soils with ultramafic parentage, is well-established (Kruckeberg 1984, 2002; Safford et al. 2005), instances of documented strongly-developed endemism on other substrates have received little attention. The discovery of an undescribed *Lomatium* strictly limited to highly plastic shrink-swell clay soils in south-central Washington in 2007 provides another likely example of strong substrate fidelity (Fig. 1). Several populations of this undescribed *Lomatium*, here designated *Lomatium tamanitchii* sp. nov. were discovered on massive landslide deposits in grassland areas in eastern Klickitat County, Washington. Confined to an area of approximately 40 km² north and northwest of the nearby town of Roosevelt, the new species forms locally dense populations. A single small disjunct population was discovered growing on heavy clay soils on private land in Union County, Oregon in June of 2009.

TAXONOMIC TREATMENT

Lomatium tamanitchii M. E. Darrach & K. K. Thie, sp. nov. (Fig. 2).—Type: USA, Washington, Klickitat Co., Columbia Hills, Old Hwy 8 4.6 air km W of Roosevelt, WA, UTM NAD27 Zone 10 5068143N 712065 / N45°44'10.21", W120°16'21.46", 192 m, 31 May 2009, Mark



FIG. 1. *Lomatium tamanitchii* habitat on heavy clay soils. Note the typical deep dessication fissures in the soil. Lack of armoring rock in this location is consistent with a sparsely-distributed population.

Darrach 0422 (holotype: WS; isotypes WTU, NY, OSC, RENO, RM, US).

Paratypes: USA. WASHINGTON. **Klickitat Co.:** Columbia Hills, Old Lady Canyon, Dot Road, 10.9 air km WNW of Roosevelt, UTM WGS 84 Zone 10 5076021N 708536E, 579 m, 19 May 2008, *Mark Darrach and Krista Thie 0302* (WS); 18 April, 2008, *Mark Darrach and Krista Thie 029* (WS).

Herba perennis, longaeva, odora, acaulescens vel caulescens, multis pilis brevis, 1.9–5.5 dm alta; radice palari incrassata cum terminatio obtusus, 9–47 cm longa et 2–28 mm diametro; caudices multiplices; basis foliis permanentis; foliis multis; laminis 7–14 cm longis, 5.5–12.5 cm latis, 2–3 plo pinnata, divisionibus ultimis anguste lanceolatis oblongisve, anguste ellipticis, 2–22 mm longis, 0.6–3 mm latis; inflorescentia post aut cum folia exorientia; pedunculis 1–14, 8–41 cm longis, erectis patentibus ascendentibusve, involucello inconspicuo, bracteolis 3–12, anguste lanceolatis linearisve, pedicellis fructificantibus 1–13 mm longis; fructibus oblongo-anguste ellipticus aut ovatus, 9.7–17.7 mm longis, 4.2–7.2 mm latis; alis angustis elevatis 0.15–0.65 mm altis.

Plant long-lived odiferous perennial with sparsely to densely hirtellous vestiture, trichomes 0.06–0.80 mm long and usually narrowly triangular in shape; becoming caulescent with age, 1.9–5.5 dm tall. Taproot simple, elongate and thickened with blunt termination, 9–47 cm long and 2–28 mm in width surmounted by a thickened occasionally simple to much more often multicipital caudex with 2–18 branches. Leaves cinereous and sparsely to densely short pubescent, compound and quadrate to rhombic in outline, ascending to occasionally erect, 4–54 per plant, 35–103 mm wide and 48–111 mm in length excluding the petiole, petiole fistulose, 2.5–17.0 cm usually broadly winged and sheathing, herbaceous and bright red-violet early in season, becoming tawny and chartaceous with age; petiole wings with 10–18 strongly developed leaves two to three times pinnatisect with ultimate segments entire and narrowly lanceolate to narrowly elliptic or oblong, acute and often with a minute non-photosynthetic apiculus; ultimate segments 2.0–22.0 mm long, and 0.6 to 3.0 mm wide leaflets typically 5, weakly to strongly overlapping, 3 to 9 in palmate to pseudopalmate arrangement with terminal leaflets usually the largest and all other leaflets progres-

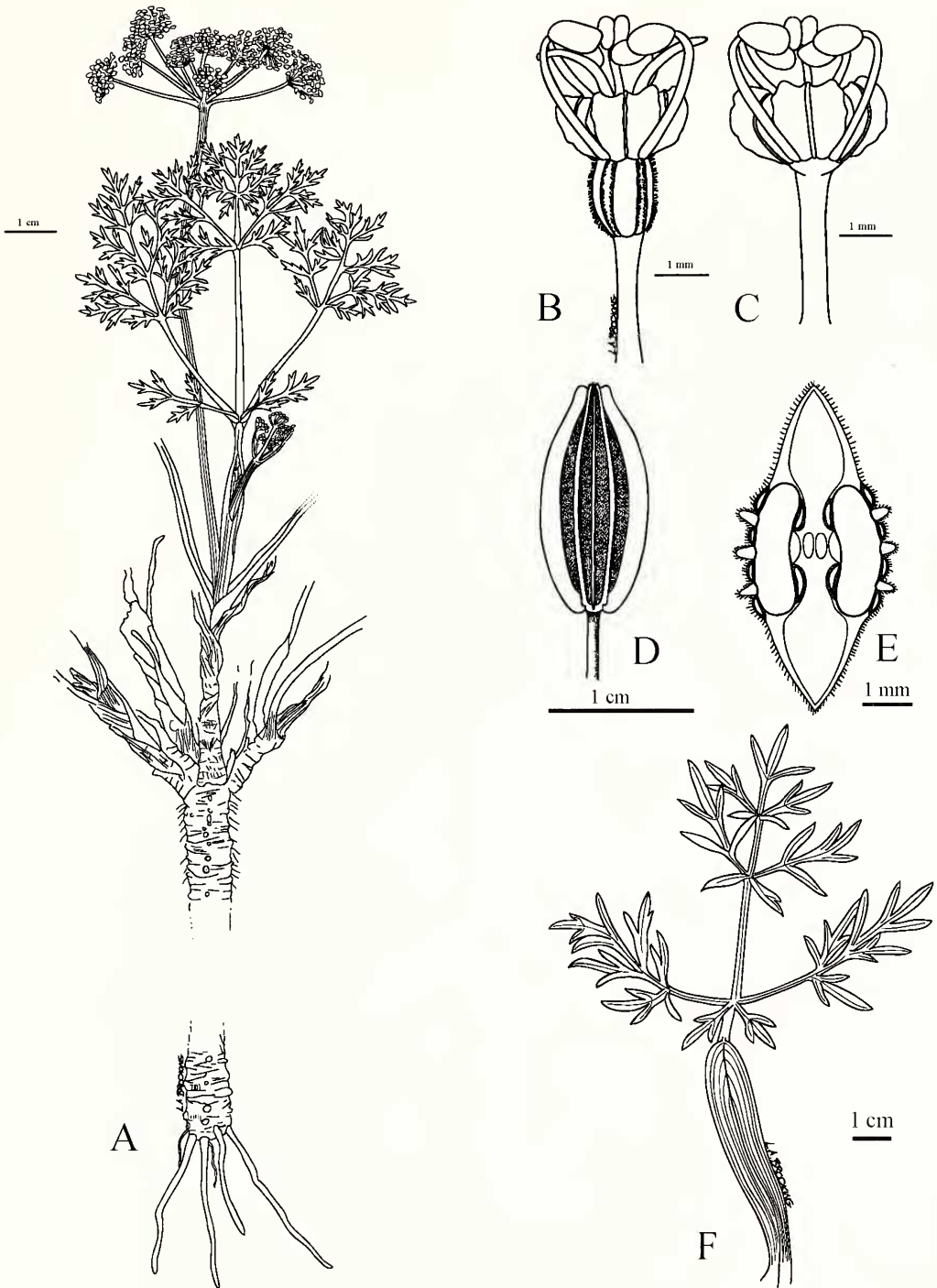


FIG. 2. *Lomatium tamanitchii* Darrach & Thie. A. Habit; B. perfect flower at anthesis; C. male flower at anthesis; D. typical fruit; E. transection of hirtellous mericarps depicting elevated fruit ribs and vittae; F. typical leaf with broadly-winged petiole.

sively reduced proximally. Pseudoscape short, often obscured by the strongly marcescent leaf bases; peduncles terete, fistulose, 8-41 cm long, weakly to strongly sigmoidal and generally subequal to the leaves at anthesis, at maturity

exceeding the leaves by 3-20 cm. Inflorescences compound, umbels 1-14 per plant; early inflorescences predominantly male, subsequent ones developing with perfect flowers; rays 3-23, unequal in length and elongating with maturation;

minimum ray lengths on inflorescences in flower range from 3–95 mm; maximum ray lengths on inflorescences in mature fruit range from 8–103 mm; short sterile or male-only rays typically early deciduous; involucre none; involucre bracts occasionally wanting, but usually present, linear, or nearly so, and free to the base, glabrous to minutely scabrous and occasionally with ciliate margins, ranging from 3–12 in number, involucre bract length 2.3–6.8 mm; bract width 0.1–0.5 mm, green and typically with scariou margins; flowering pedicels 0.8–5.0 mm; mature fruiting pedicels spreading to ascending, range 1.0–13.3 mm. Flowers 18–47 per umbellet; petals yellow with clear to greenish midvein, obovate with narrow incurved apiculus or acuminate tip, range 1.3–2.1 mm in length and 1.1 mm in width; ovary strongly hirtellous (much less so with age) with distinctive easily dislodged narrowly triangular trichomes; style recurved 1.0–2.0 mm in length. Fruit spreading to suberect, dorso-ventrally compressed, narrowly elliptical, oblong to rarely ovate, tawny with rich brown dorsal intervals, 9.7–17.7 mm in length and 4.2–7.2 mm wide, sparsely to densely hirtellous with narrowly triangular trichomes 0.03–0.15 mm long; wings corky-thickened with gently undulating margins, 0.8–2.1 mm wide; dorsal surface with distinct raised narrow ribs developing early and persisting to maturity, 0.15–0.65 mm in height and consistently 0.20 mm in width; well-developed vittae 3–5 (typically 4) in the intervals, 3–5 (typically 4) on the commissure, occasional additional vestigial vittae along the commissure, carpophore bipartite, persistent, oval to elliptical, often somewhat flattened on abaxial side in cross-section. A composite illustration of the species is provided in Figure 2.

The specific epithet is derived from the word *ta-ma-ni-tch* which translates roughly to “plant” in the Yakama language. It honors the Pacific Northwest native peoples’ extensive knowledge and contribution to the understanding of the natural history of plants in the genus *Lomatium* (Hunn and French 1981; Thie 2000).

Lomatium tamanitchii grows on plastic soils derived from devitrified silicic volcanic ash layers intercalated as water-reworked deposits between lava flows of the Miocene age Pomona Member of the Saddle Mountains Basalt within the regionally extensive Columbia River Basalt Group. The ash deposits are mapped as being included within the Ellensburg Formation (WADNR 2009).

Associated vascular plant taxa known to co-exist with *Lomatium tamanitchii* include: *Allium acuminatum*, *Amsinckia menziesii*, *Balsamorhiza careyana*, *B. serrata*, *Bromus tectorum*, *Calochortus macrocarpus*, *Crepis* sp., *Delphinium nuttallianum*, *Ericameria nauseosa*, *Epilobium brachycarpum*, *Fritilaria pudica*, *Helianthus cusickii*, *Lagophylla ramosissima*, *Lithophragma parviflora*,

Lomatium grayii, *Nothocalais troximoides*, *Poa bulbosa*, *P. secunda*, *Pseudoroegneria spicata*, *Rosa woodsii*, *Taeniatherum caput-medusae*, *Tetradymia canescens* and *Triteleia grandiflora*.

Lomatium tamanitchii was first observed and informally collected on June 7th, 2007. Detailed images of these specimens were shared with Joy Mastroguissepe at the Marion Ownbey Herbarium at Washington State University (WS) in Pullman, WA, and Dr. James Kagan with the Oregon Natural Heritage Program in Portland, OR. As a result of discussions with these two botanists and scrutiny of specimens at WS, the University of Washington Herbarium (WTU), and the herbaria at Oregon State University (ORE, OSC, and WILLU), the Klickitat County specimens are recognized as distinct. In the field the species is most readily identified by the following combination of characters: shortly hairy leaves and fruit, filiform raised ribs on the fruit, short ultimate leaflet segments, persistent marcescent leaf bases, a highly branched caudex, and restriction of the plants to heavy clay soils.

The raised narrow ribs on the fruit of *L. tamanitchii* resemble those of *L. suksdorfii* (S. Watson) J. M. Coult. & Rose, and the closely related *L. thompsonii* (Mathias) Cronquist. In addition, *L. thompsonii* often has shortly hairy leaves and inflorescence rays similar to *L. tamanitchii*. Both species are rare narrow endemics with all known *L. suksdorfii* populations occurring in western Klickitat Co., Washington and adjacent Wasco and Hood River counties in Oregon. These occurrences are 30 to 50 km from any known *L. tamanitchii* populations. All known occurrences of *L. thompsonii* are approximately 200 km to the north in Chelan Co., Washington. However, both these species are considerably more robust than *L. tamanitchii* and have larger fruits that are glabrous at maturity, 15–32 mm long × 6–12 mm wide for *L. suksdorfii* and *L. thompsonii* versus 10–18 mm × 4–7 mm for *L. tamanitchii*, as well as displaying typically less dissected leaves with longer ultimate segments.

Lomatium tamanitchii is readily distinguished from most varieties of *L. triternatum* (Pursh) J. M. Coult. & Rose as this common species typically has glabrous and much longer leaflets, and fruits without narrow, raised ribs. However, raised ribs were observed on the fruits of *Whited 1821* (OSC) from Chelan Co., Washington. More confusing, *L. triternatum* var. *brevifolium* (J. M. Coult. & Rose) Mathias displays shortly hairy fruits and vestiture. It was initially described as *Lomatium brevifolium* from specimen Howell 379 (isotype originally at ORE and now at OSC) believed to have been collected in western Klickitat Co., Washington (Coulter and Rose 1900). This taxon is found within 10–15 km of *L.*

tamanitchii populations, growing on loamy substrates derived from basalt parentage. Suspecting that the type collection of this taxon might be *L. tamanitchii*, we examined specimens and high resolution photographs of *Howell 379* from OSC and NY. The specimens have slightly immature fruits that lack the narrow, raised ribs that can be observed at this phenological stage on *L. tamanitchii*. Also, leaflets on *L. triternatum* var. *brevifolium* are nearly invariably much more elongated than those of *L. tamanitchii* with foliage hairs that are linear rather than narrowly triangular. In the field, additional features readily distinguish the two taxa. *Lomatium tamanitchii* typically has marcescent leaf bases and a branched caudex. It also tends to occur in very dense populations that can be recognized from some distance owing to the cinereous vestiture of the foliage. *Lomatium triternatum* var. *brevifolium* usually produces a single stem from its unbranched caudex and tends not to grow in dense populations.

We provide a key that distinguishes *L. tamanitchii* from the species in southern Washington and northern Oregon with which it is most likely to be confused.

PHENOLOGY, ECOLOGY, AND CONSERVATION

Lomatium tamanitchii emerges in early to mid-March with inflorescences either coetaneous or early serotinous relative to the foliage. Immature fruit are present by mid-May. Mature fruit are present and dehiscent by early June to early July. *Lomatium tamanitchii* grows exclusively on shrink-swell, clay-rich soils on which cryptobiotic cover is lacking. The plants usually occur in very dense, near-monocultural patches with canopy cover often in excess of 90 percent. Estimated plant densities of 75 to 150 individuals per square meter are frequently encountered. Extrapolated across the known range of the species, this equates to millions of individuals.

Densely packed *L. tamanitchii* populations conform to particular settings that suggest a mechanism for their formation. They are either found on flat or nearly flat aspects, or on slopes on which there is a well-developed armoring of cobble-size rock fragments derived from nearby eroded basalt flows. On slopes where rock armoring is absent or minimal, shrink-swell cycles are apt to produce significant soil surface movement that make successful seedling estab-

lishment problematic, and a rather uncommon event. Surface texture in locations such as these invariably presents with the popcorn-like structures typical of soils with a large swelling clay mineral component. Populations of *L. tamanitchii* in this setting are invariably sparse, but individual plants attain maximum size and highest flower and seed production for the species, most probably because competition factors are muted. On flat aspects and on armored soils on slopes, the severity of soil disturbance as a function of shrink-swell cycles is apparently somewhat reduced. The combination of mostly bare soil and reduced soil surface mobility apparently provides a fertile setting for successful seedling colonization which leads to the establishment of dense populations. Competitive interactions between the plants in this setting are likely intense, and the number of individuals with adequate resources to reproduce successfully may be limited (e.g., Weiner 1988). In these areas relatively few of the plants flower at any one time.

Lomatium tamanitchii is abundant within a limited known area, and therefore conforms to the geographically small distribution/narrow habitat specificity rarity category of Rabinowitz (1981). Its overall distribution is surmised to be restricted owing primarily to the regional rarity of the host soil type. The recent and continuing conversion of what have heretofore been grazing lands to other purposes, in particular large-scale wind farm development projects, is permanently altering substantial tracts of land in this area. This creates a setting in which the conservation status of the species deserves careful consideration. Using the Conservation Status Rank Calculator developed by NatureServe (2009) and utilizing information available at the present time, *L. tamanitchii* receives a G2G3 ranking.

The private ranchlands where *L. tamanitchii* is found have a history of cattle grazing. As such, much of the area is dominated by weedy vegetation. However, relatively large expanses of the area display an ecologically intact early-to locally later-seral bluebunch wheatgrass – Great Basin big sagebrush community. Field observations suggest that populations of *L. tamanitchii* have not been negatively impacted by land use history.

Further field investigations in appropriate habitats are needed; they may reveal additional populations in south-central Washington and adjacent Oregon south of the Columbia River.

KEY TO *LOMATIUM* SIMILAR TO *L. TAMANITCHII*

1. Mature fruit length ≥ 15 mm; plants > 50 cm tall
 2. Ultimate leaflet segments ≥ 18 mm long; vestiture glabrous; plants of western Klickitat Co., Washington and adjacent Hood River and Wasco Cos., Oregon *L. suksdorfii* (Watson) J. M. Coult & Rose
 - 2' Ultimate leaflet segments ≤ 18 mm long; vestiture short hairy/cinereous; plants of Chelan Co., WA *L. thompsonii* (Mathias) Cronquist
- 1' Mature fruit length ≤ 15 mm; plants < 50 cm tall; plants sometimes growing on clay-rich substrates

- 3. Mature fruit glabrous and narrowly oblong; <3.5mm wide and sessile or subsessile on the umbellets; plants typically growing on clay-rich substrates *L. bicolor* var. *leptocarpum* (J. M. Coult. & Rose) Schlessman
- 3' Mature fruit 3.5–7.5 mm wide; glabrous to sparsely to densely hirtellous; fruit clearly pedicellate on the umbellets
- 4. Fruit glabrous; vestiture (sub)glabrous with ultimate leaflet segments long - usually all well in excess of 10 mm *L. triternatum* (Pursh) J. M. Coult. & Rose var. *triternatum*
- 4' Fruit and leaves sparsely to (usually) densely finely hairy
 - 5. Developing and mature fruit without narrow raised dorsal ribs; caudex single; fruit trichomes linear; plants not growing on clay-rich soils; plants usually >50 cm tall; plants of central and western Klickitat Co., Washington *L. triternatum* (Pursh) J. M. Coult. & Rose var. *brevifolium* (J. M. Coult. & Rose) Mathias
 - 5' Mature and developing fruit with very narrow raised ribs; plants often with multicapital caudex; fruit trichomes mostly narrowly triangular; plants strictly of clay-rich soils; eastern Klickitat Co., Washington and one known locale in Union Co., Oregon *L. tamanitchii* Darrach & Thie

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